

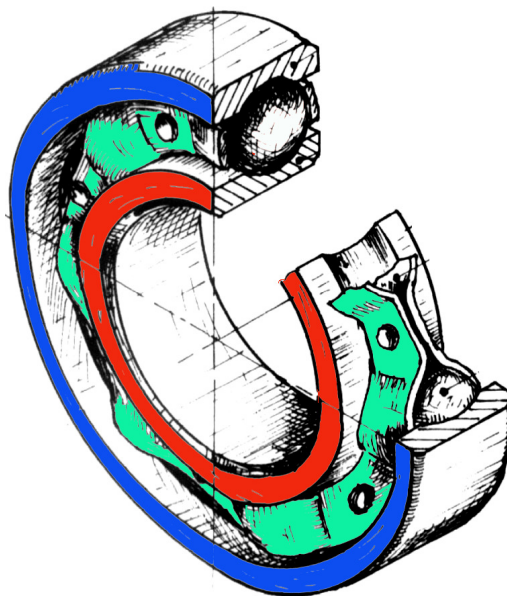
# Rolling Bearings

2 October 2010

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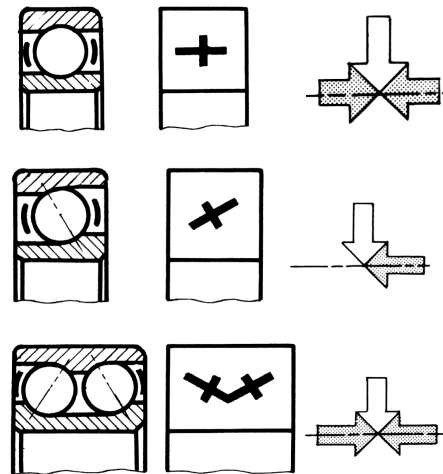
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## Single Row Ball Bearing



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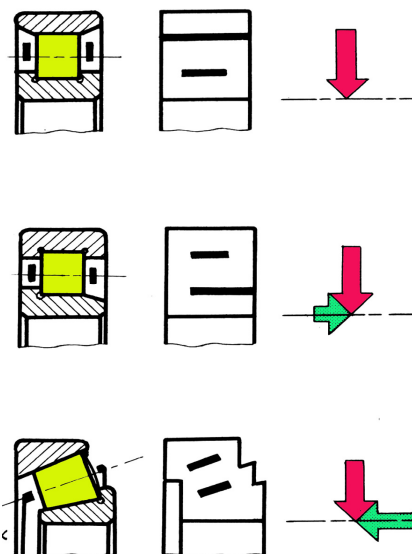
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**Ball Bearings under Load**

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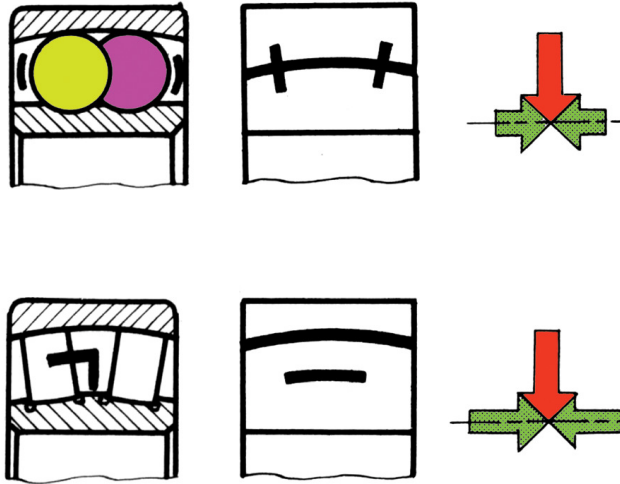
**Roller Bearings under Load**

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### Self-Aligning Bearings under Load

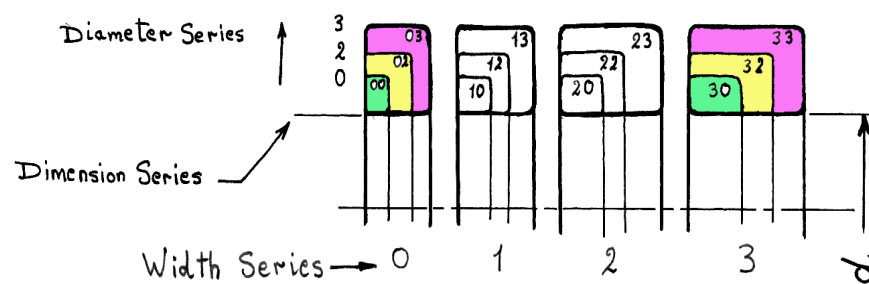


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### Basic Dimensions And Bearing Reference Numbers :

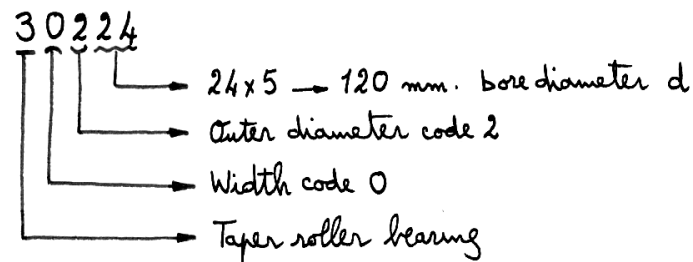
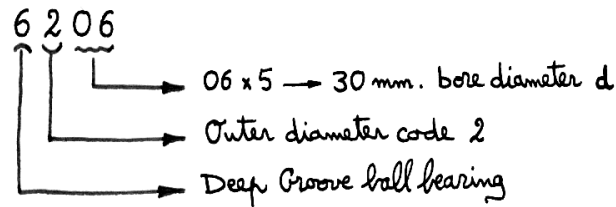


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### Build-up of Bearing Reference Numbers :



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### Dynamic Capacity of Bearings

$$L = \left( \frac{C}{P_{eq}} \right)^n$$

Nominal life in million of revolutions →  $L$

Basic dynamic capacity in kg. →  $C$

Exponent of the life formula  
 $n = 3$  for ball bearings  
 $= \frac{10}{3}$  for roller bearings

Equivalent bearing load in kg. →  $P_{eq}$

$$L_h = \frac{10^6 \times L}{60 \times N}$$

Nominal life in working hours →  $L_h$

Rotational speed in r.p.m. →  $N$

i.e.  $L = \frac{L_h \times 60 \times N}{10^6}$

$$P_{eq} = x \cdot P_r + y \cdot P_a$$

Equivalent dynamic bearing load →  $P_{eq}$

Radial factor →  $x$

Actual radial load →  $P_r$

Axial factor →  $y$

Actual axial load →  $P_a$

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### Values of Nominal Life in Hours

1. Machines used for short periods and whose break down would not have serious consequences : Hand tools, domestic machines, agricultural machines, ... 4,000 ~ 8,000
2. Machines working intermittently whose breakdown would have serious consequences : Electric motors for agricultural equipment and domestic heating and refrigerating appliances, conveyor belts, lifts, workshop cranes, ... 8,000 ~ 12,000
5. Machines for continuous use 24 hrs/day :  
Compressors, pumps, stationary electric machines, mine hoists, ... 50,000 ~ 60,000
6. Ships propeller shaft thrust bearings, stationary electrical machines, ... 60,000 ~ 100,000

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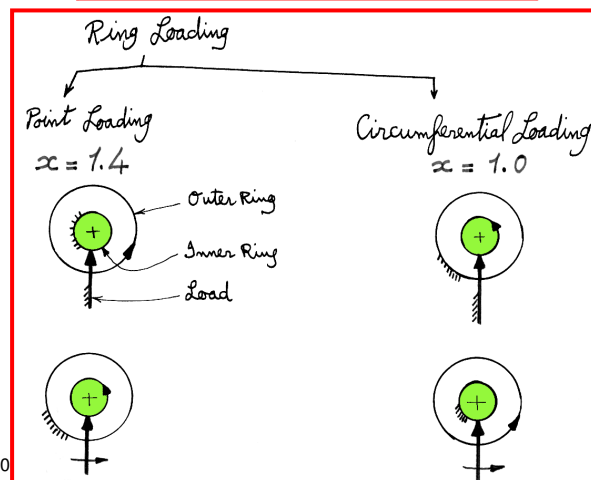
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### Radial Factor $x$

$$P_{eq} = x \cdot P_r + y \cdot P_a$$

Equivalent dynamic bearing load      Actual radial load      Radial factor      Axial factor      Actual axial load



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### Axial Factor $y$

$$P_{eq} = x \cdot P_r + y \cdot P_a$$

Equivalent dynamic bearing load

Radial factor

Axial factor

Actual radial load

Actual axial load

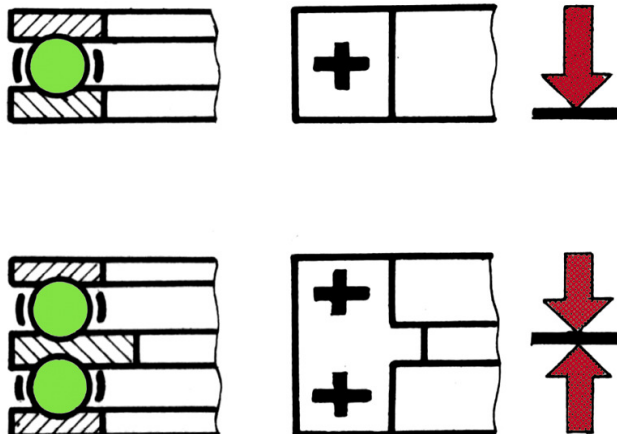
1. Deep Groove Ball Bearings	$C/P_a$ :	5	10	20	40
	$y$ :	1.4	1.6	1.8	2.0
2. Angular Contact Ball Bearings	single	0.7			
	double	1.3			
3. Self-Aligning Ball Bearings	1.5 $\rightarrow$ 4.5				
4. Taper Roller Bearings	1.4 $\rightarrow$ 1.8				
5. Self-Aligning Barrel Roller Bearings	single	9.5			
	double	3.2 $\rightarrow$ 6.4			

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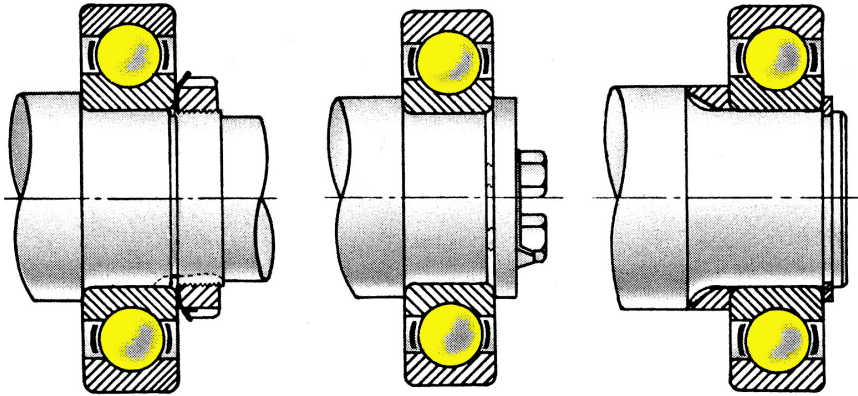
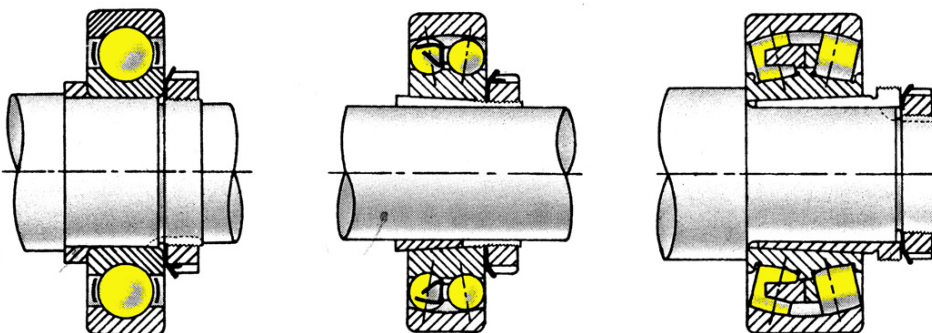
### Thrust Ball Bearings under Load

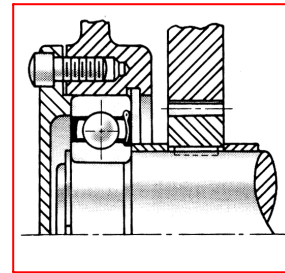
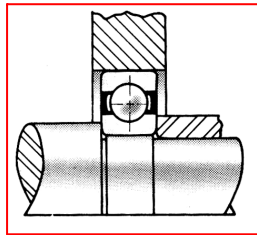
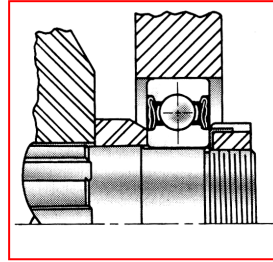
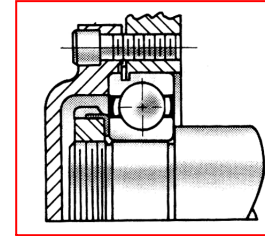
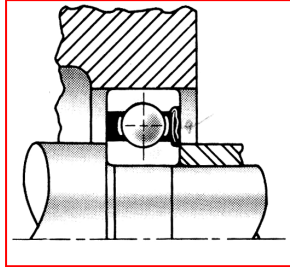
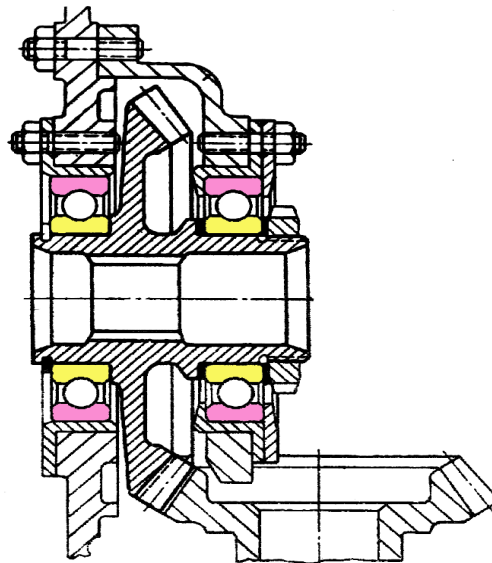


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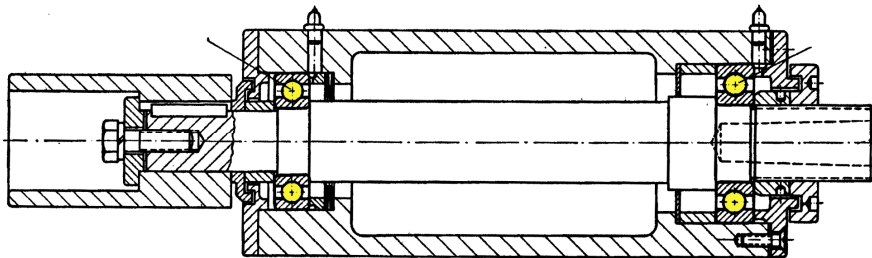
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**Fixation of Bearings to Shaft****Fixation of Bearings to Shaft**

**Fixation of Bearings to Shaft and Housing****Location of Bearings**



**Location of Bearings**

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**Location of Bearings**